



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

MECHANICS.

Conducted by B.F.FINKEL, Kidder, Missouri. All contributions to this department should be sent to him.

SOLUTIONS OF PROBLEMS.

17. Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy, Ohio University, Athens, Ohio.

Find the law of density of strings collected into a heap at the edge of a table with the end of the string just over the edge, so that equal masses may always pass over in equal units of time.

II. Solution by the PROPOSER.

Let x = the length of string which depends from the edge of the table at the end of the time t from the beginning of motion, k = the density of the string at a unit's distance from the end, and assume that the density varies as the n th power of the distance from the end. The mass of the depending length is then $= \int_0^x kx^n dx = \frac{k}{n+1} x^{n+1}$, and if a = the mass passing over the edge in a unit of time, and g = the acceleration of gravity, we have for the equation of motion, $\frac{d}{dt} \left(\frac{k}{n+1} x^{n+1} \frac{dx}{dt} \right) = gat \dots (1)$,

$$\text{or, } \frac{d}{dt} \left(\frac{k}{n+1} x^{n+1} \frac{dx}{dt} \right) = \frac{k}{n+1} g x^{n+1} \dots (2),$$

$$\text{or, } \frac{d}{dt} \left(x^{n+1} \frac{dx}{dt} \right) = g x^{n+1} \dots (3).$$

Multiplying both members of (3) by $2 \left(x^{n+1} \frac{dx}{dt} \right)$ and integrating,

$$\left(x^{n+1} \frac{dx}{dt} \right)^2 = \frac{2g}{2n+3} x^{2n+3} \dots (4), \text{ or, } \frac{dx^2}{dt^2} = \frac{2g}{2n+3} x \dots (5).$$

$$\text{Equation (5) gives } \frac{d^2 x}{dt^2} = \frac{g}{2n+3} \dots (6),$$

$$\text{whence } \frac{dx}{dt} = \frac{g}{2n+3} t \dots (7).$$

$$\text{From (7), } gat = a(2n+3) \frac{dx}{dt} = \frac{d}{dt} \left(\frac{k}{n+1} x^{n+1} \frac{dx}{dt} \right) \dots (8).$$

$$\text{Integrating (8) and dividing by } x, \frac{k}{n+1} n \frac{dx}{dt} = a(2n+3) \dots (9).$$

$$\text{Equation (9) gives } \frac{1}{t} \cdot \frac{k}{n+1} x^{n+1} = a(n+1)(2n+3) = a \dots (10),$$

since the mass of string passes over at the uniform rate a .

$$\text{Equation (10) gives } 2n^2 + 5n = -2, \text{ or } n = -\frac{1}{2}, \text{ or } n = -2.$$